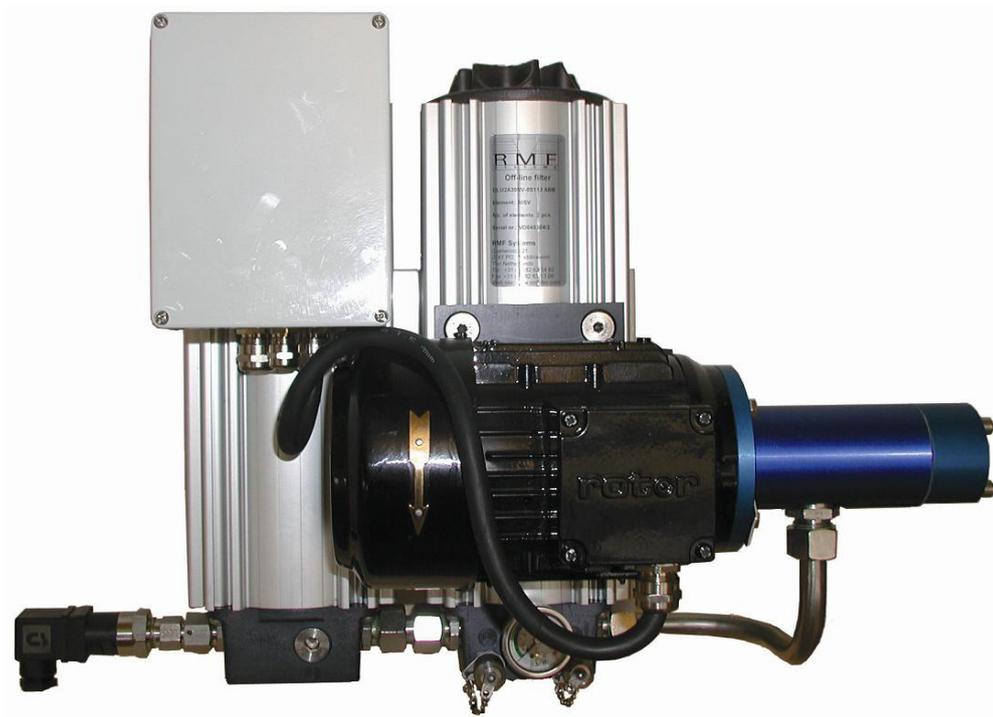


Oil filter unit for on-load tap-changers

Manual



Manufacturer:
Filtertechnik Sverige AB, Karlstad, Sweden

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Recommended practices

ABB recommends careful consideration of the following factors when installing an oil filter unit.

Before you install a unit, make sure that the personnel doing the job have read and fully understood the documents provided with the unit.

To avoid damaging the unit, never exceed the operating limits stated in delivery documents and on rating plates.

Do not alter or modify a unit without first consulting ABB.

Follow local and international wiring regulations at all times.

Use only factory authorized replacement parts and procedures.

WARNING, CAUTION and NOTE

WARNING

A **WARNING** provides information which, if disregarded, could cause injury or death.

CAUTION

A **CAUTION** provides information which, if disregarded, could cause damage to the equipment.

NOTE: A **NOTE** provides additional information to assist in carrying out the work described.

Safety precautions

WARNING

Almost all types of oil are potential threats to the environment and as such they should not be drained into ordinary sewers and "dumped" in nature. Always check that all oil carrying components are sealed and tight before operating the oil filter unit.

Be aware that oil spillage on the floor around the filter unit is a safety risk!

Used filter elements very often contain harmful substances separated from the oil. Always pack and seal used elements thoroughly until they can be disposed of in accordance with local regulations.

Switch off the electrical power supply to the filter unit when carrying out maintenance, and especially before opening the terminal box of the electric motor and the terminal box of the pressure switch.

The oil filter unit may be hot. Be careful!

CAUTION

Do not expose the filter unit to ambient temperatures higher than 60 °C (140 °F) as this may harm electrical wires, hoses and other rubber or synthetic components!

The fluid temperature inside the filter unit must never exceed 110 °C (230 °F). Higher fluid temperatures may cause damage to the seals and packings on and in the filter unit.

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1 General information

1.1 Advantages with an oil filter unit

All on-load tap-changers manufactured by ABB are designed and tested for service in transformer oil without any kind of filtration. Filtration of the oil is necessary only when normal maintenance is carried out.

However, filtering gives the following advantages:

- Maintained high dielectric strength in the oil. Important in line end applications.
- Eliminates risk for depositing "sludge" in electrically highly stressed areas.
- Reduces mechanical wear. Beneficial in applications with high operation frequency.
- Simplifies maintenance since no cleaning and no further oil filtration is necessary. This is also important from a health point of view for the service staff and it also shortens the transformer outage time.

The oil filter unit allows continuous service of the transformer during filtration.

The oil filter unit and the filter insert is delivered by ABB. The on-load tap-changer is also prepared for connection to the oil filter unit. All electrical equipment is installed in the electric connection box. The tubes for connection between the oil filter unit and the on-load tap-changer are not included in the delivery of the oil filter unit.

This manual gives information for one oil filter unit. In case of two or more units on the same transformer, all procedures are the same for each one of the units.

1.2 The oil filter unit

See Fig. 1.

The filter unit consists of a filter base, two or four filter housings, an electric motor, a pump, an electric connection box, two sample valves and two threaded connections. There is also a pressure switch that could be used by the customer. This switch gives a signal when the pressure drop over the filter is such that a filter insert replacement is necessary. This switch does not stop the motor; it only gives information about the filter status.

The oil pump is mounted on the motor. The pump is of the screw type. Two sample valves and the motor are mounted on the filter base.

The filter housings are also mounted on the filter base. Filter inserts are delivered separately and must be mounted in the filter housings before starting the filter unit.

There is also a pressure gauge which measures the pressure drop over the filter. At a certain pressure drop a filter insert replacement is necessary.

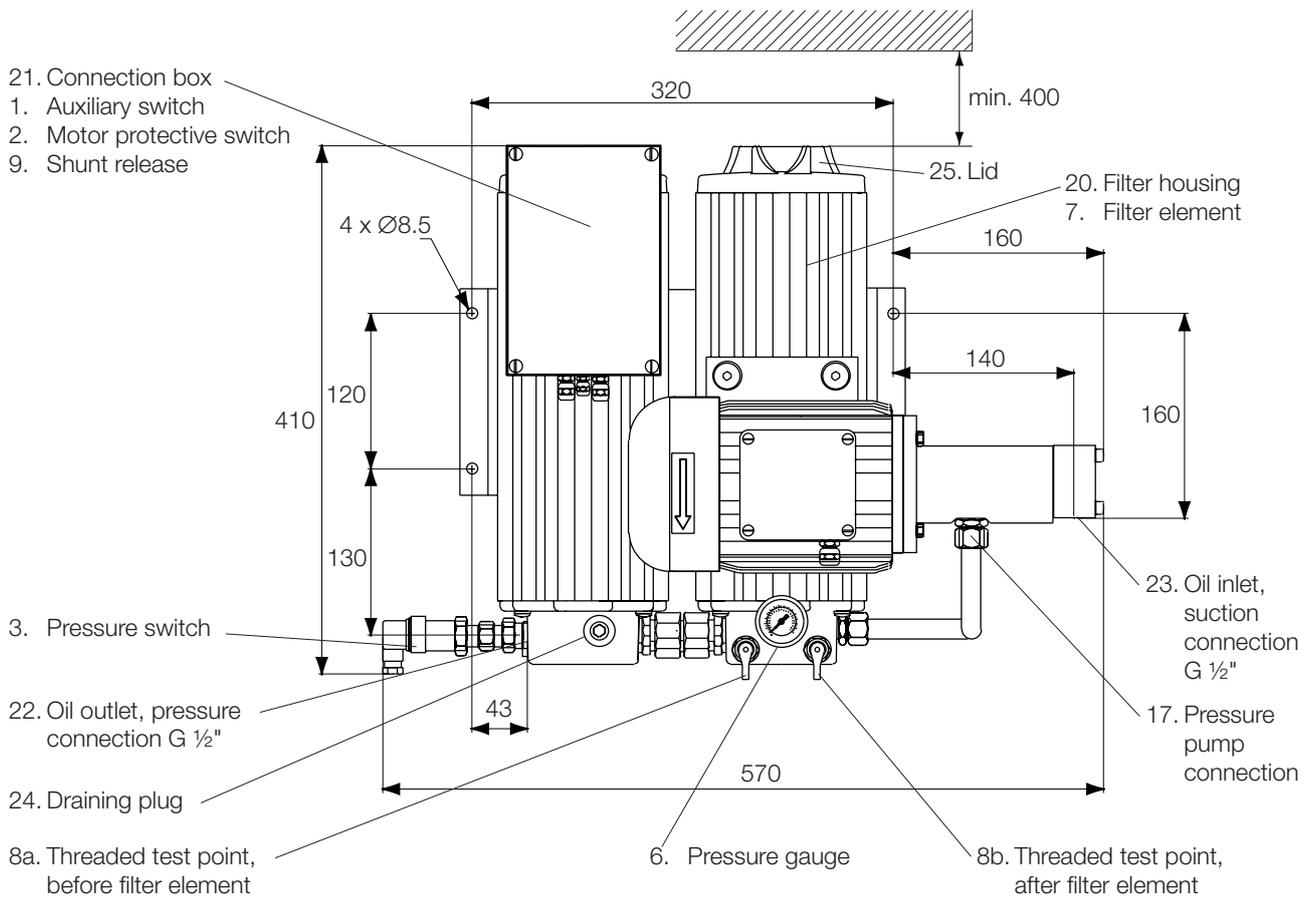
Each of the filter housings contains a lid with o-ring and a filter insert.

The inlet connection is placed on the underside of the pump. The outlet connection is placed on the filter base.

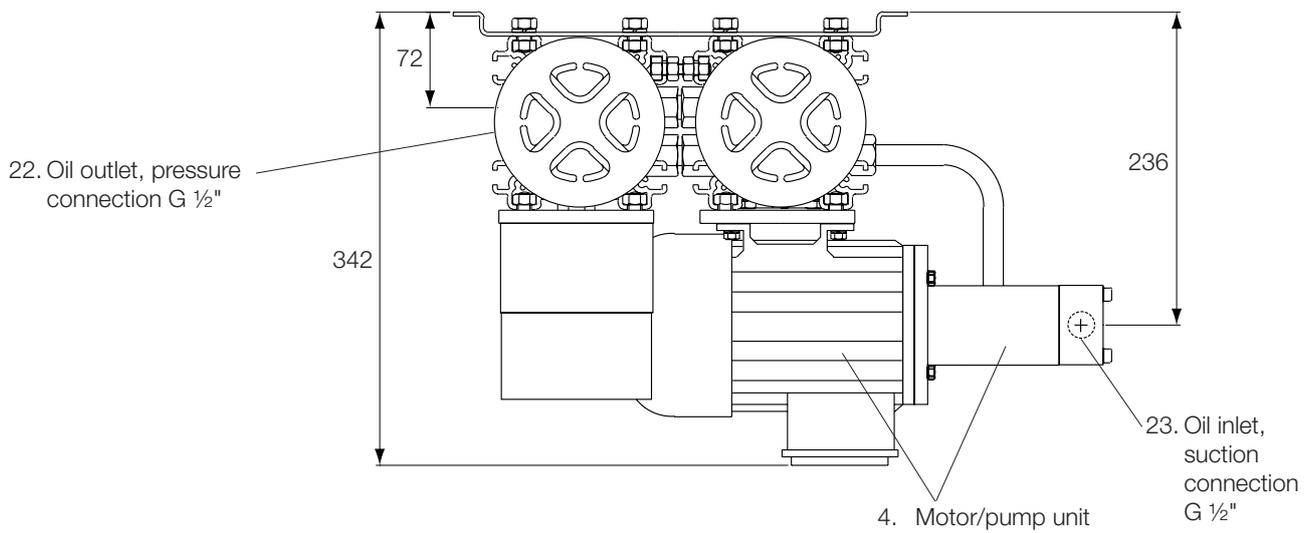
1.2.1 Strainer

The oil pump in the filter unit will be damaged if big particles (such as welding sparks, dirt from grinding processes or sealing agent) are allowed to enter the oil pump. To prevent that, a strainer with a mesh width of 0.5 mm is delivered with the oil filter unit. This strainer should be mounted in the oil suction pipe close to the oil filter unit.

When the oil filter unit has been running for a while, e.g. two months, the strainer must be cleaned from particles. The cleaning should be repeated at every exchange of filter element, or if, for some reason, the oil pipes have been dismantled, to make sure no big particles can enter the oil pump.



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Fig. 1a. Filter unit with two filter elements.

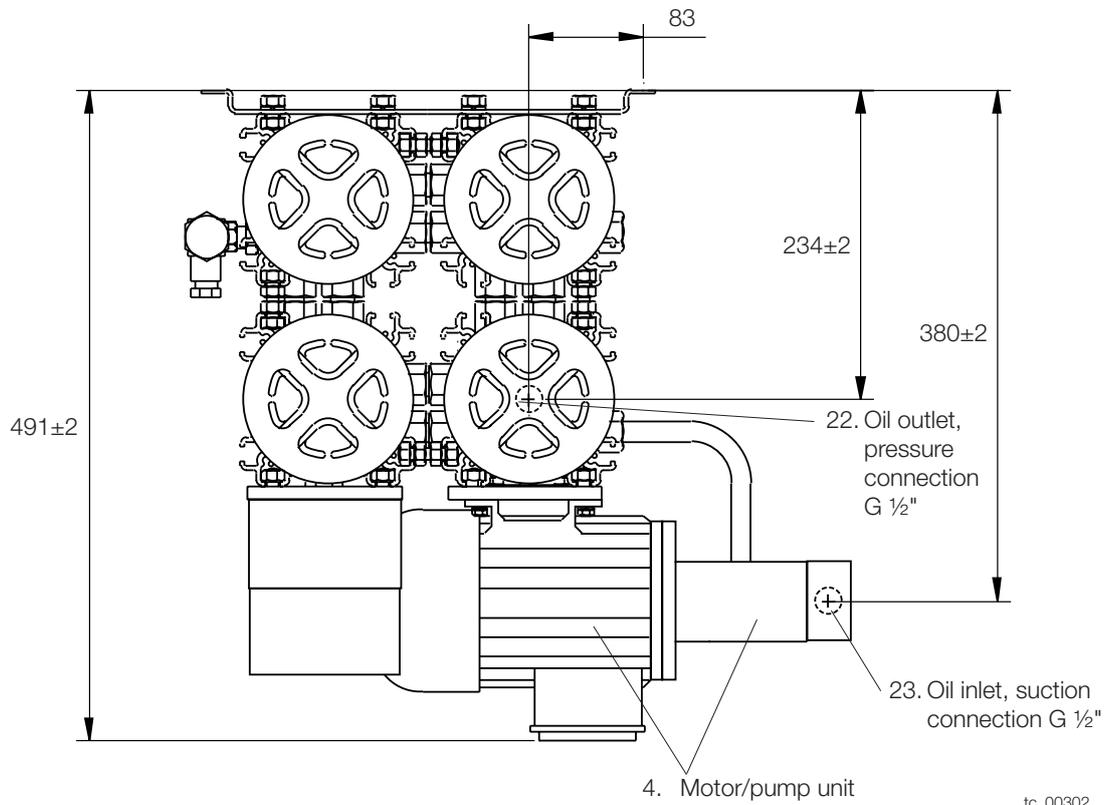
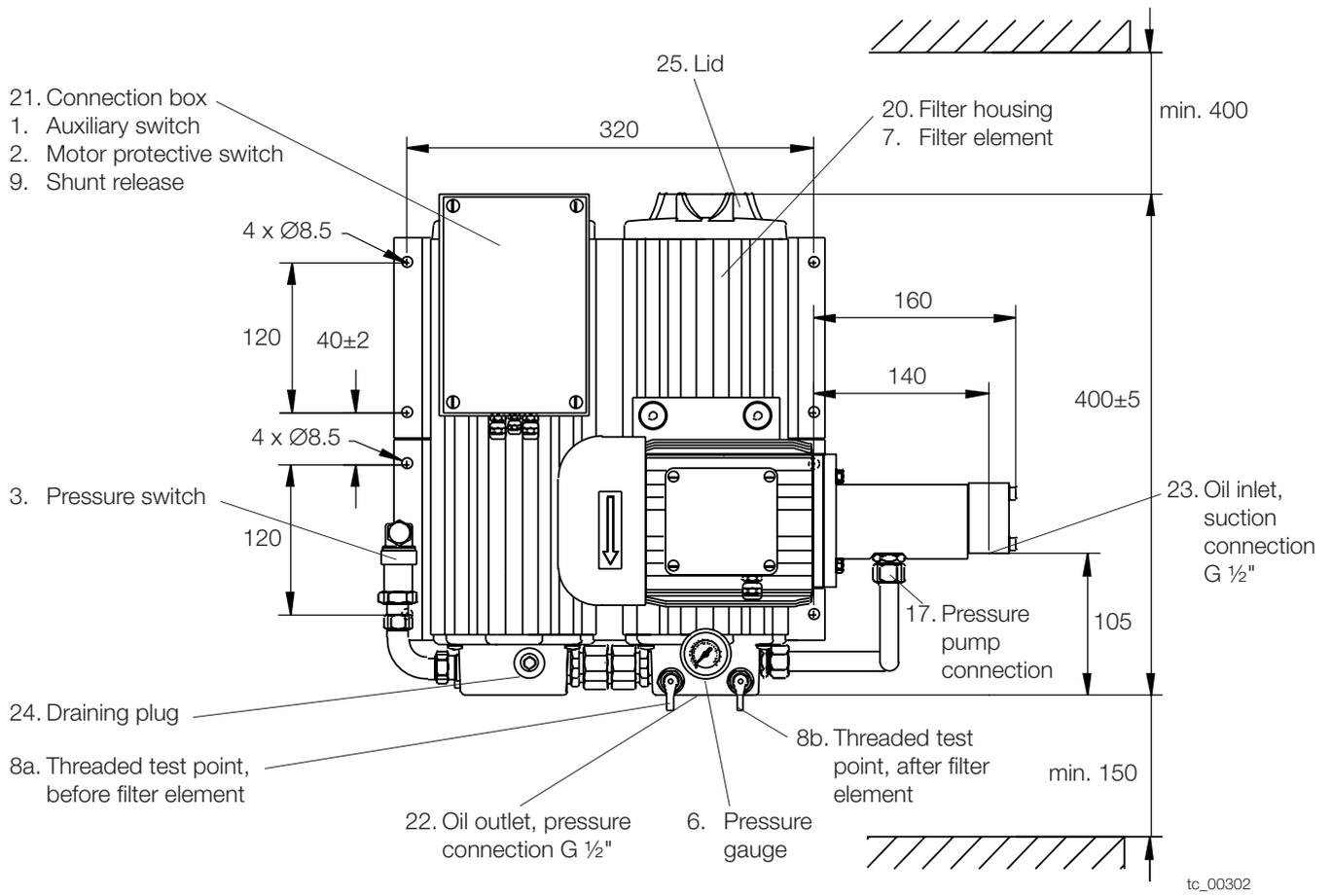
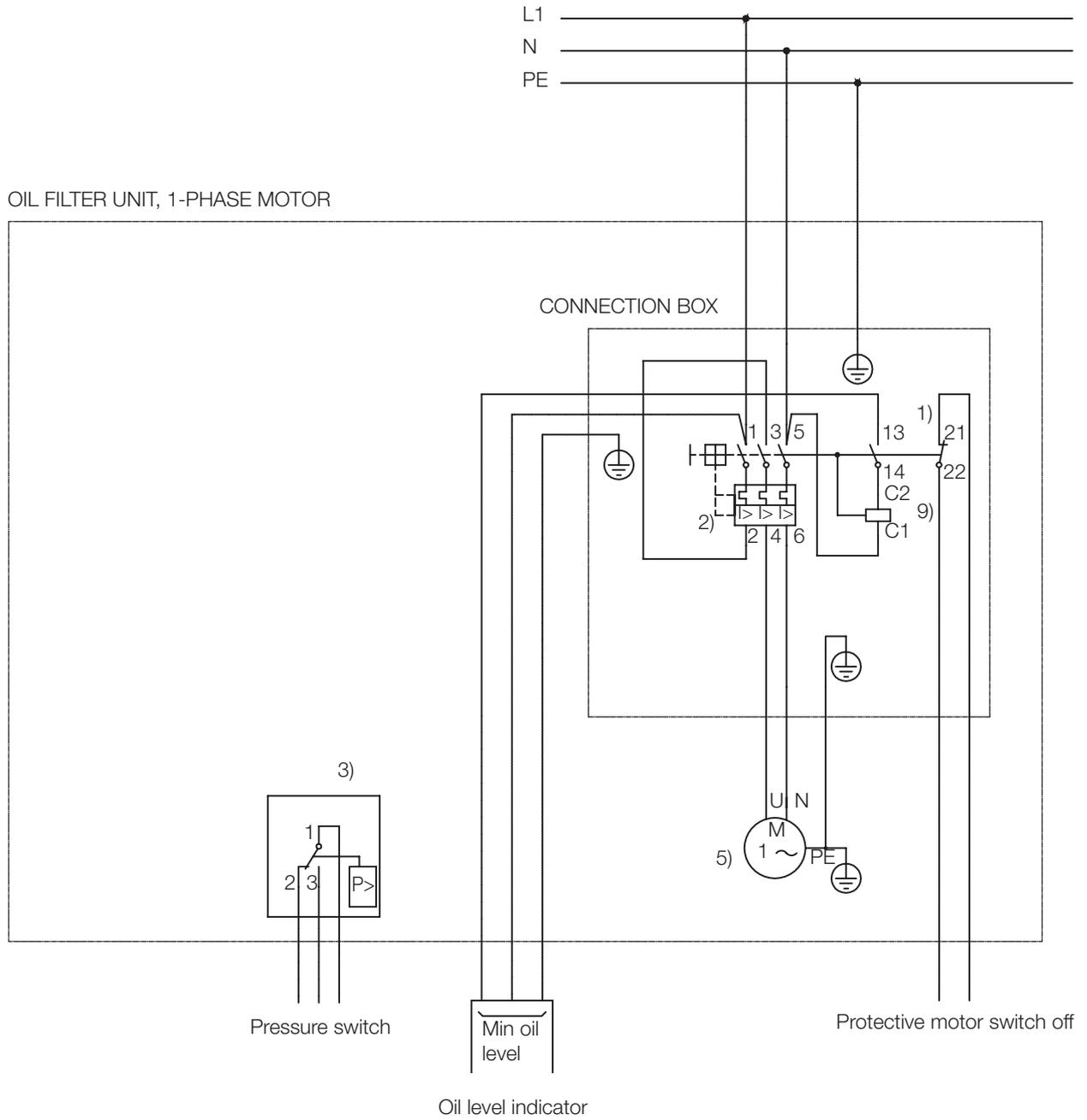


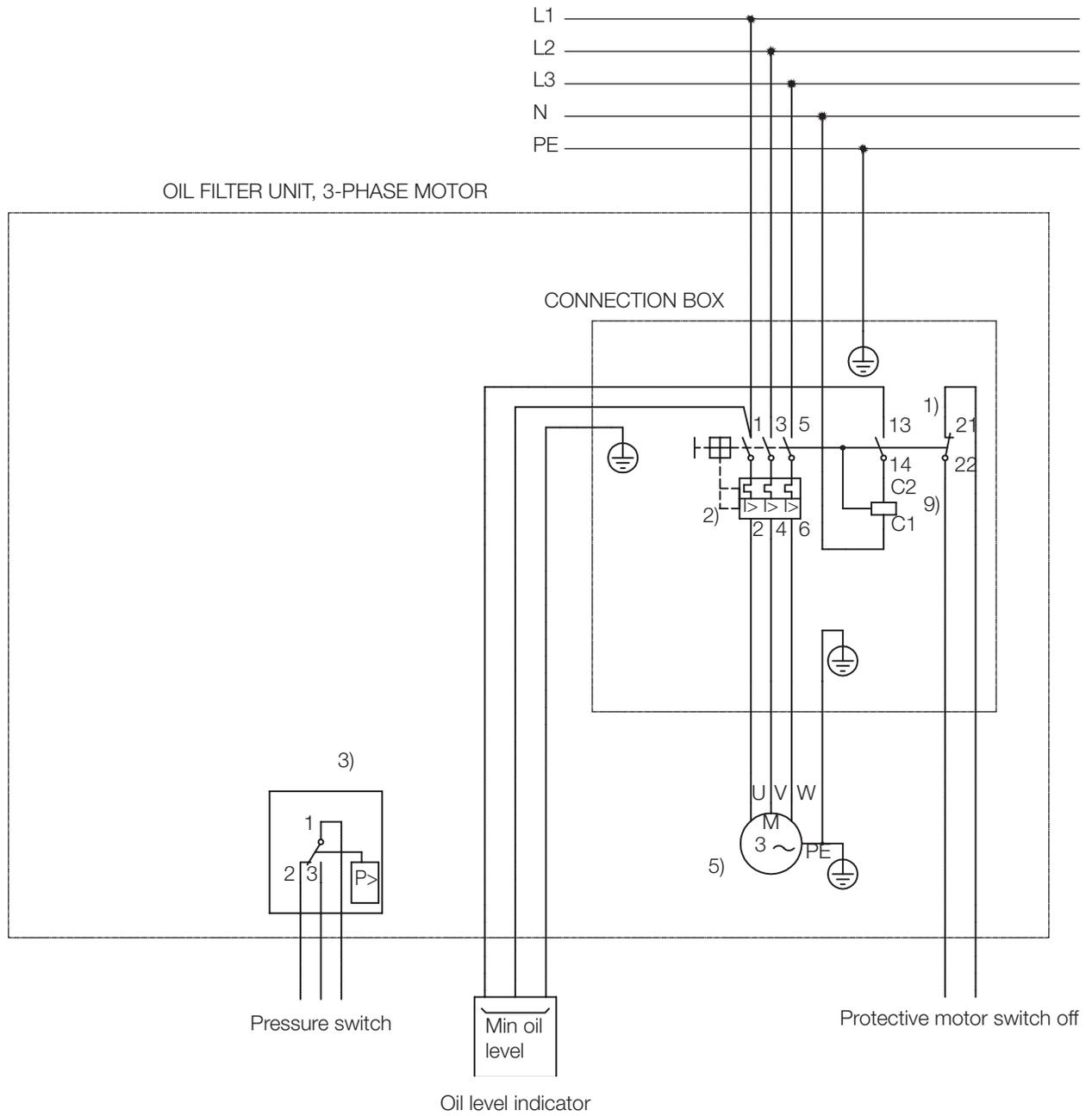
Fig. 1b. Filter unit with four filter elements.



- 1) Auxiliary switch
- 2) Protective motor switch
- 3) Pressure switch
- 5) Motor
- 9) Shunt release

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Fig. 2a. Circuit diagram for oil filter unit with single phase motor.



- 1) Auxiliary switch
- 2) Protective motor switch
- 3) Pressure switch
- 5) Motor
- 9) Shunt release

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Fig. 2b. Circuit diagram for oil filter unit with 3-phase motor.

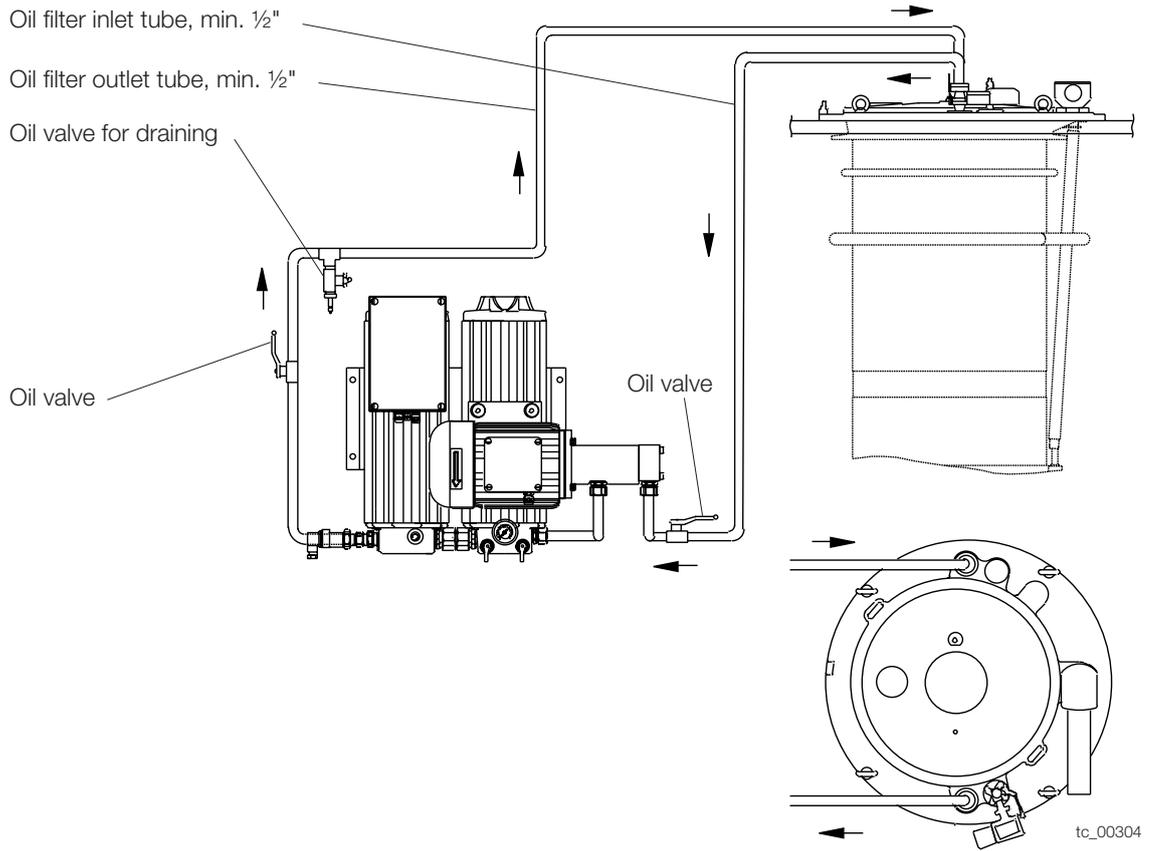


Fig. 3a. On-load tap-changer type UC with oil filter unit (UCC shown).

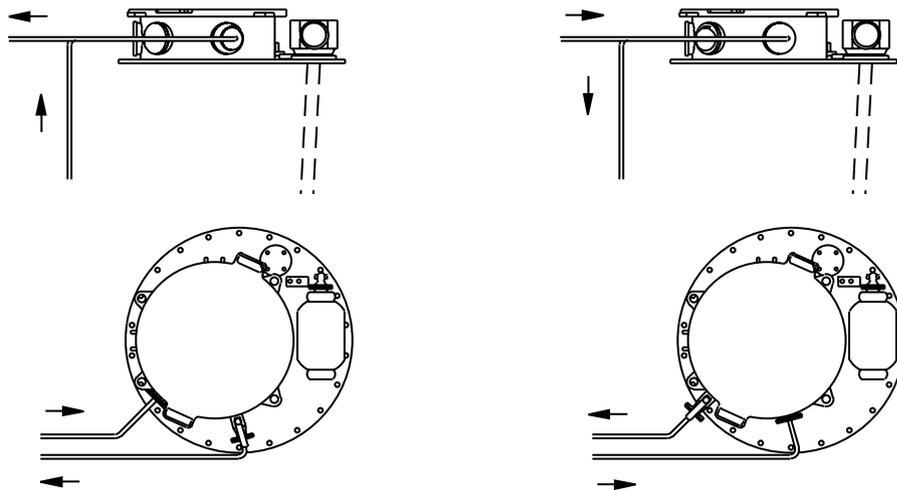


Fig. 3b. UCG

Fig. 3c. UCL

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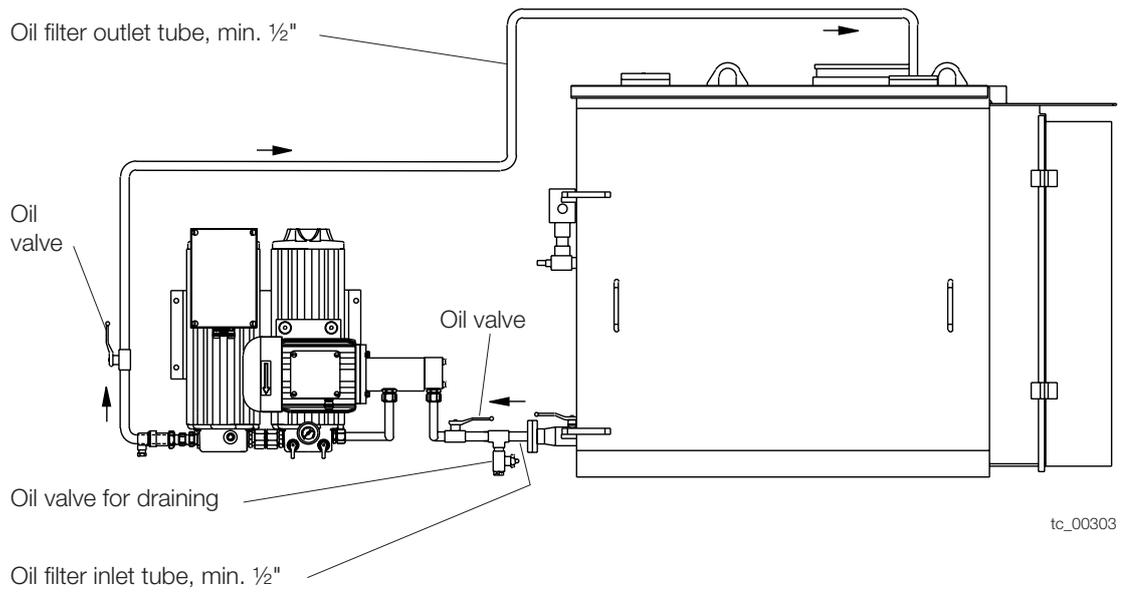


Fig. 4. On-load tap-changer type UZ with oil filter unit.

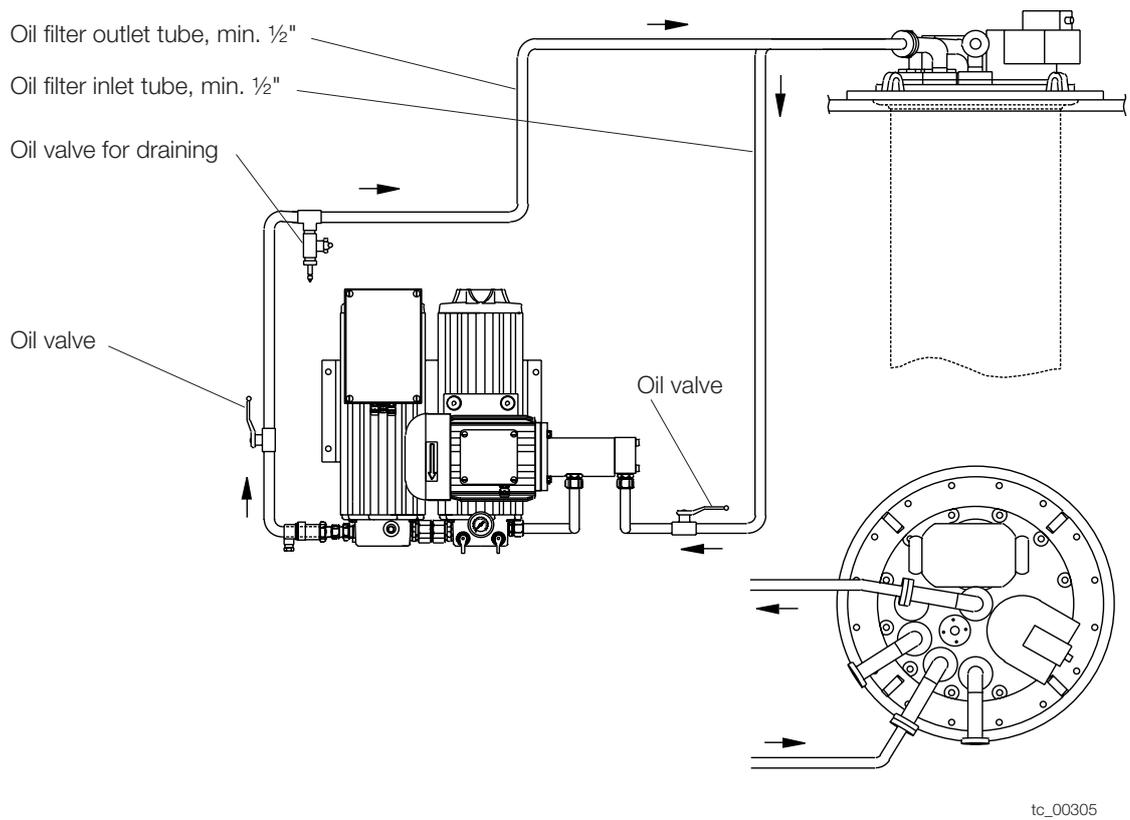


Fig. 5. On-load tap-changer type UB with oil filter unit.

1.3 Electrical equipment

See Fig. 2.

The oil filter unit needs an electric power supply to the motor. This power supply should be connected to the motor protective switch in the connection box.

The pressure switch has three connections. The signal from this switch is recommended to be used in a control room as an indication for filter insert replacement.

The motor protective switch has a status indication contact which shows if the motor circuit breaker is off. This contact is recommended to be connected in a way that makes a trip immediately visible in the control room.

It is recommended to connect the "low level contact" signal from the oil level indicator on the conservator, so it trips the motor protective switch by the trip coil, in case of oil leakage in the oil filter circuit.

Since the oil filter is working continuously, no other electrical components are necessary.

1.4 Oil filter circuit

See Figs. 3-5.

The oil filter should be placed lower than the return connection of the tap-changer. The oil filter circuit is the same for all the different types of on-load tap-changers. The only difference is the connection to the on-load tap-changers. The inlet tube is connected to the UC and UZ on-load tap-changers by flanges on the oil valves. On UB on-load tap-changers, the oil inlet tube is connected to a flange on a tube in the centre of the cover. No valve is mounted. All flanges for the inlet tube have dimensions according to Fig. 6.

The inlet and outlet connections on the filter unit are threaded with dimension G ½".

The inlet tube should have a valve close to the oil filter unit to make it possible to shut off the oil flow in case of filter insert replacement, repair work, etc.

The filter outlet tube for the UB and UC types of on-load tap-changers is connected to the free flange on the head of the on-load tap-changer. Dimensions according to Fig. 6. The position of this free flange may vary, depending on where the pressure-relay and the tube to the conservator are connected.

WARNING

Make sure the outlet tube is not connected to the OLTC transformer main tank flange.

The filter outlet tube for the UZ type of on-load tap-changers is connected to a flange on the top of the tank, see Fig. 4. This flange has dimensions according to Fig. 7. The exact position is shown on the dimension drawing for the on-load tap-changer.

In the filter outlet tube, immediately after the oil filter unit, a valve should be connected like in the inlet tube. After this valve a T-piece with a valve on should be connected, see Figs. 3-5. This valve is used to simplify the oil filling and the oil draining.

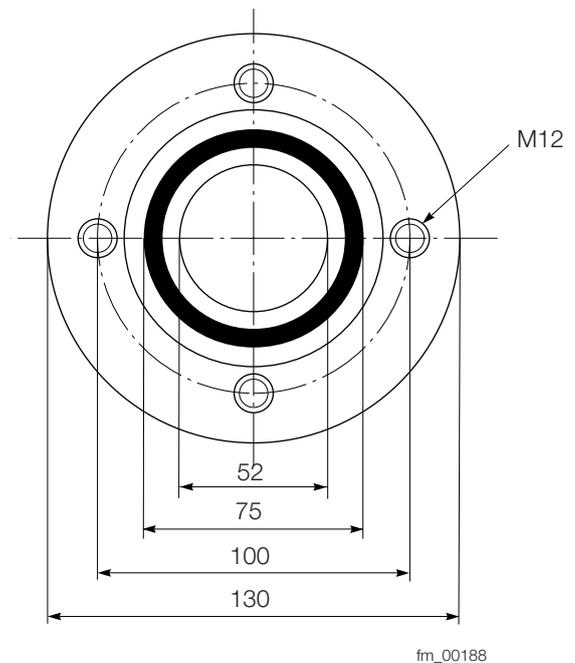
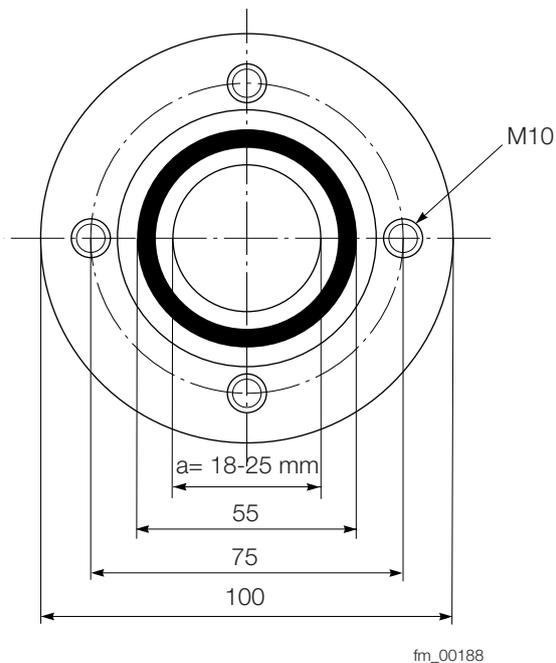


Fig. 6. Flange on on-load tap-changers type UBB and UC.

Fig. 7. Flange on on-load tap-changers type UZ.

1.5 Continuous oil filtration

The oil filter is working according to the continuous operation principle. Thus the filtration runs continuously with a low and smooth flow rate.

This gives a number of advantages:

- Narrower pipes might be used.
- Little control equipment required.
- No changes in flow rates eliminates release of already trapped particles.
- Reduced risk of foam and gas bubbles.
- Moisture removal works even if the tap-changer is not operating.

The necessary components are placed in the electric control box. The maximum power needed is approximately 370 W per unit. The average power needed during a life cycle of the filter insert is considerably lower.

1.6 Filtration medium

The oil filter unit should only be used for filtering transformer oil according to IEC 60296. For other media, please consult ABB.

1.7 Service temperature

The ambient temperature may vary between -40 °C and +60 °C (-40 °F and +140 °F). Normal operating range for the filtrated oil is from 0 °C to +110 °C (+32 °F to +230 °F). An oil filter unit with a new filter insert can be started with an oil temperature down to -25 °C (-13 °F) provided that the viscosity is 1000 cSt or lower.

If the filter insert has been in service for a while and a pressure drop has been built up, the pressure switch may give alarm when starting at low oil temperatures. This can be avoided by letting the transformer oil be warmed up to at least 0 °C (32 °F) before the oil filter unit is switched on. The pressure switch will give signal until the warm oil from the on-load tap-changer has come into the oil filter unit.

If the pressure switch is still giving signal after half an hour, wait until the transformer oil has become even warmer and then start again.

If the transformer is subjected to many starts in very low temperatures (e.g. spare transformers), make sure that the filter insert is changed frequently.

If the service conditions are such that the ambient temperature is very low (often and during long periods below -10 °C (14 °F)), the oil temperature of the transformer is low and the inlet tube is long (>3 m), the filter inlet tube should be insulated.

1.8 Filter insert replacement interval

At service on a normal network on-load tap-changer with a low switching frequency (0-30 operations a day as an average) the filter insert is replaced at normal tap-changer overhaul, provided that the pressure drop has not exceeded 4.5 bar and the breathing devices of the on-load tap-changer have worked properly.

The filter insert should be replaced when the pressure drop exceeds 4.5 bar or latest when the pressure switch trips.

If the breathing devices of the on-load tap-changer has failed, enough water may have entered the on-load tap-changer to saturate the filter insert. In such case, replace the filter insert.

The pressure drop should be read when the on-load tap-changer is judged to be at normal service temperature.

1.9 Leakage in the oil filter unit circuit

There is always a risk of leakage in an outer oil circuit, with a too low oil level in the tap-changer housing as a result. This risk is reduced by using an oil level indicator with an alarm contact for low level on the conservator. The signal is used to give alarm in the control room, and to trip the motor protective switch of the oil filter unit by activating the trip coil. See the wiring diagrams in Fig. 2.

1.10 Oil level in the on-load tap-changer

NOTE: When filling oil into an on-load tap-changer with an oil filter unit, fill oil in excess into the conservator to avoid refilling afterwards!

Approximately 5.5 liters for oil filter unit with 2 filters.

Approximately 12 liters for oil filter unit with 4 filters.

1.11 Ordering data

When ordering an oil filter unit the following must be given:

- The motor voltage
- The voltage for the trip coil of the motor circuit breaker.

1.12 Spare parts

NOTE: Avoid ordering spare filter inserts until they are needed. They can not be stored for more than one year without reduced water removing capacity. See also chapter 7.

1.13 Technical specifications

1.13.1 Technical specification OLU2A30SNV-AS113ABB

Motor:	Type: 1-phase, squirrel-cage Data: 220-240 V/0.37 kW 50/60 Hz Speed: 1340-1610 rpm Protection class: IP55
Oil pump:	Flow rate: 250-300 l/h Over-pressure valve: Opening pressure 5.0 bar
Filter insert:	Type: 30 SNV Material: Cellulose Specially dried for water absorption Filtering grade: < 3 µm absolute Typically pressure drop at 20 °C temperature, new filter insert: <0.1 bar Max. storage time: 12 months, with undamaged package.
Pressure switch:	Adjusted value: 4.5 bar Max. voltage: 230 V AC, 24 V DC Max. current: Res. load 5 A, Ind. load 3 A Protection class: IP65 Terminals: max 1.5 mm ² , max. cable diameter 8 mm
Noise:	<68 dB(A) ISO 4412
Connecting tubes:	Min. 1/2"
Connections:	G 1/2" ISO 228-1
Option:	Flange connection, dimensions as on the on-load tap-changer, see Fig. 6
Material:	Stainless steel, aluminum, anodized steel
Electric connection box:	1 cable gland M20, cable diameter 8-13 mm 1 cable gland M16, cable diameter 5-9 mm Max. 2 x 2.5 mm ² wire on each terminal.

1.13.2 Technical specification OLU2A30SNV-CS113ABB

Motor:	Type: 1-phase, squirrel-cage Data: 110-127 V/0.37 kW 50/60 Hz Speed: 1340-1610 rpm Protection class: IP55
Oil pump:	Flow rate: 250 - 300 l/h Over-pressure valve: Opening pressure 5.0 bar
Filter insert:	Type: 30 SNV Material: Cellulose Specially dried for water absorption Filtering grade: < 3 µm absolute Typically pressure drop at 20 °C temperature, new filter insert: <0.1 bar Max. storage time: 12 months, with undamaged package.
Pressure switch:	Adjusted value: 4.5 bar Max. voltage: 230 V AC, 24 V DC Max. current: Res. load 5 A, Ind. load 3 A Protection class: IP65 Terminals: max 1.5 mm ² , max. cable diameter 8 mm
Noise:	<68 dB(A) ISO 4412
Connecting tubes:	Min. ½"
Connections:	G ½" ISO 228-1
Option:	Flange connection, dimensions as on the on-load tap-changer, see Fig. 6
Material:	Stainless steel, aluminum, anodized steel
Electric connection box:	1 cable gland M20, cable diameter 8-13 mm 1 cable gland M16, cable diameter 5-9 mm Max. 2 x 2.5 mm ² wire on each terminal.

1.13.3 Technical specification OLU2A30SNV-XS113ABB

Motor:	Type: 3-phase, squirrel-cage Data: 500 V/0.37 kW 50 Hz Speed: 1360 rpm Protection class: IP55
Oil pump:	Flow rate: 260 l/h Over-pressure valve: Opening pressure 5.0 bar
Filter insert:	Type: 30 SNV Material: Cellulose Specially dried for water absorption Filtering grade: < 3 µm absolute Typically pressure drop at 20 °C temperature, new filter insert: <0.1 bar Max. storage time: 12 months, with undamaged package.
Pressure switch:	Adjusted value: 4.5 bar Max. voltage: 230 V AC, 24 V DC Max. current: Res. load 5 A, Ind. load 3 A Protection class: IP65 Terminals: max 1.5 mm ² , max. cable diameter 8 mm
Noise:	<68 dB(A) ISO 4412
Connecting tubes:	Min. ½"
Connections:	G ½" ISO 228-1
Option:	Flange connection, dimensions as on the on-load tap-changer, see Fig. 6
Material:	Stainless steel, aluminum, anodized steel
Electric connection box:	1 cable gland M20, cable diameter 8-13 mm 1 cable gland M16, cable diameter 5-9 mm Max. 2 x 2.5 mm ² wire on each terminal.

1.13.4 Technical specification OLU2A30SNV-0S113ABB

Motor:	Type: 3-phase, squirrel-cage Data: 220-433 V/0.37 kW 50 Hz; 208-480 V/0.37 kW 60 Hz Speed: 1360-1640 rpm Protection class: IP55
Oil pump:	Flow rate: 260-310 l/h Over-pressure valve: Opening pressure 5.0 bar
Filter insert:	Type: 30 SNV Material: Cellulose Specially dried for water absorption Filtering grade: < 3 µm absolute Typically pressure drop at 20 °C temperature, new filter insert: <0.1 bar Max. storage time: 12 months, with undamaged package.
Pressure switch:	Adjusted value: 4.5 bar Max. voltage: 230 V AC, 24 V DC Max. current: Res. load 5 A, Ind. load 3 A Protection class: IP65 Terminals: max 1.5 mm ² , max. cable diameter 8 mm
Noise:	<68 dB(A) ISO 4412
Connecting tubes:	Min. ½"
Connections:	G ½" ISO 228-1
Option:	Flange connection, dimensions as on the on-load tap-changer, see Fig. 6
Material:	Stainless steel, aluminum, anodized steel
Electric connection box:	1 cable gland M20, cable diameter 8-13 mm 1 cable gland M16, cable diameter 5-9 mm Max. 2 x 2.5 mm ² wire on each terminal.

2 Installation

2.1 General

The oil filter unit should be mounted at ground level in order to enable maintenance and repair work without de-energizing the transformer and to avoid gas collection.

Figs. 3-5 show the valves that are recommended to use in the oil circuit. The air valve for air cushion restoring is only needed if the on-load tap-changer is filled with degassed oil and/or is seldom operated.

A special bracket plate has to be placed on the transformer. Dimensions for fixing screw joint, see Fig. 1.

For the UC types of tap-changers, up to three units should be mounted, one for each tap-changer.

2.2 Tools

- Normal set of handtools
- Small pipewrench

2.3 Material

- A small vessel (oil resistant)
- Cleaning paper

2.4 Weight

Approximately 27 kg for oil filter unit with 2 filters.

Approximately 47 kg for oil filter unit with 4 filters.

2.5 Receiving

2.5.1 Unpacking

Check that the package is undamaged.

Normally the filter units are delivered in boxes of plywood. Therefore only the assembly screws should be removed. Every filter unit is packed in a plastic bag with a package of silica gel in it.

Lifting of the box should be carried out with a lifting device. Avoid manually heavy lifting.

2.5.2 Inspection on receipt

1. Check that the oil filter unit, the pressure gauge and the pressure switch are undamaged.
2. If transport damage is found, and it is judged that correct operation of the oil filter unit is not possible, a damage report should be sent to the insurance company. It is also recommended that photographs are taken of the damaged details. Mark the photos with ABB's reference number and the serial number of the oil filter unit, and send them to ABB for comments.

2.5.3 Temporary storage before assembly

If the oil filter unit is not to be assembled immediately once the delivery has been approved, keep the oil filter unit and the oil filter insert in the delivery package.

CAUTION

The package of the filter insert must not be opened! The special package ensures maintained water absorption capacity of the filter insert.

2.6 Mounting

Mounting may be carried out after mounting of the on-load tap-changer in the transformer factory or at commissioning on site.

A distance of 400 mm is necessary above the filter housing to enable exchange of filter inserts. The filter unit should be mounted on a vibration free surface. The pressure gauge should be visible and easy to read. The sample valves should be easily accessible.

CAUTION

Remove the plastic plugs from the inlet and outlet connections before installation.

2.6.1 Plumbing

CAUTION

Do not open the filter insert package at this stage!

NOTE: *Plumbing is recommended to be carried out after oil filling of the on-load tap-changer.*

Start by mounting the oil filter unit to a bracket plate on the transformer. Manufacture an inlet tube and an outlet tube as recommended in Figs. 3-5, depending on which type of on-load tap-changer the filter is to be connected to. Dimensions of connecting flanges, see section 1.4 or the dimension drawing delivered with the on-load tap-changer.

WARNING

Do not mix inlet and outlet. The cleaning of the oil will be poor, and in worst case, a flashover may occur in the on-load tap-changer.

The connection points are shown in Figs. 3-5. UCG and UCL have vertical flanges instead of horizontal as shown in Fig. 3 (UCC). Connect the inlet tube to the valve with flange. The outlet tube from the oil filter unit is connected to any of the free flanges, except to the one connected to the transformer tank. For UBB on-load tap-changers there are a flange connection without a valve in the middle of the cover.

On UZ on-load tap-changers there is a special flange for oil filter outlet tube, see the dimension drawing for the unit or Fig. 4 in this manual.

Try to keep the tubes as short and with as few joints as possible. If the tubes are longer than 5 metres, increase the tube diameter to ¾".

If the transformer should operate on sites where the temperature frequently falls below -10 °C (+14 °F), it is recommended to insulate the inlet tube.

Make sure that the tubes are clean before connection to the on-load tap-changer.

Also make sure that all seals are in place before connecting the flanges.

2.6.2 Electrical connection

Only qualified personnel should attempt installation of electrical equipment.

Make sure that the available voltage and frequency is in accordance with the rating of the electric motor.

Connect the motor supply to the electric connection box as shown in the wiring diagram in Fig. 2 in this manual. Plug unused cable glands. The pressure switch can be connected as an option according to the customers needs.

WARNING

Make sure that the voltage is properly switched off before starting wiring work!

It is also recommended to use an oil level indicator with a contact for low oil level in the conservator, and connect it so a trip from that contact will switch off the motor protective switch for the oil filter unit, and give an alarm in the control room. See the wiring diagrams in Fig. 2.

Make sure that the motor has the correct rotation direction by comparing the rotation direction of the fan with the arrow on the motor.

WARNING

If the rotation direction is wrong, the cleaning of the oil will be poor, and in worst case, a flashover may occur in the on-load tap-changer.

3 Commissioning

When the on-load tap-changer is filled with oil and all the plumbing and the wiring are done, the oil filter unit can be started.

CAUTION

If the oil filter unit is to be dismantled from the transformer during transportation, do not mount the filter insert. In case of dismantling, the oil has to be drained from the oil filter unit and air to be let in. The moisture in the air will reduce the water absorption capacity of the filter insert.

Make sure that all valves are shut. See Fig. 1.

Dismantle the lid (Item No 25) by turning it counterclockwise.

CAUTION

Do not carry out the filter insert mounting during rain without covering the oil filter unit. Also avoid mounting during foggy weather.

Remove the package of silica gel from the filter inserts before installation

Attach an o-ring to the lid (A new o-ring is delivered with the new filter insert).

Lower the filter into the filter housing (Item No 20). Fill up with oil.

Lightly oil the o-ring. Put the lid on the filter housing and tighten it by hand by turning it clockwise.

Open the valves and the filter unit is ready to be started. Check that no leaks have occurred.

Make a final check of the oil flow direction by closing the valve on the outlet tube slowly. The pressure gauge should show increasing pressure. If it is possible to shut the valve without pressure increase, the motor rotates in the wrong direction. Change direction by changing place of two supply wires to the 3-phase motor.

WARNING

Make sure that the voltage is properly switched off before starting wiring work!

Open the oil valve fully afterwards.

Then switch on the voltage and make a new check of the rotation direction of the motor.

When the motor has been checked to rotate in the right direction, the oil filter unit will now operate without inspection.

4 Transportation

The oil filter unit may be transported mounted on the transformer, provided that it is properly fixed.

If the unit should be dismantled before transportation, proceed as follows:

Prepare the on-load tap-changer as stated in the applicable guide.

If the unit has been oil filled, drain as follows:

Shut all valves. Drain all oil from the filter housing (20). The bucket may be emptied before the draining is completed.

Dismount the tubes. Keep the O-rings, the nuts, and the washers.

CAUTION

Oil will pour out from the tubes when they are loosened. Prepare for taking care of that oil!

NOTE: *The sealing in the flange of the on-load tap-changer work with “rubber excess” which makes the O-rings looking somewhat damaged, but they can be reused provided that they are left in their positions or refitted in the same position as they had earlier.*

Mount the covers on the return flange of the on-load tap-changers. Mount a cover on the flange for the inlet tube on the UB on-load tap-changer.

Remove all wirings.

WARNING

Make sure that the voltage is properly switched off before starting wiring work!

The oil filter is transported in its delivery package which can be reused.

Remounting at site is done by using appropriate parts according to section 2.6.

Restart the oil filter unit by using appropriate parts according to section 3.

5 Maintenance

The oil filter unit is maintained during the annual inspection of the on-load tap-changer and during the normal maintenance of the on-load tap-changer.

The only maintenance needed is replacement of the filter insert when necessary.

5.1 Tools

- Flat tool or flat steel bar, approx. 300 x 30 x 5 mm
- Allen key 8 mm

5.2 Material

- Spare filter insert

For ordering, see chapter 7 Spare parts list.

5.3 Annual inspection

During the annual inspection of the on-load tap-changer, the pressure gauge is read. Note the reading so the change from year to year can be seen.

If the pressure is 4 bar or more, or close to 4 bar, the filter insert should be replaced.

NOTE: *The pressure increase goes faster at the end of the filter insert lifetime.*

If moisture is suspected to have come into the on-load tap-changer compartment, the filter insert should be replaced.

Also check for leakages. All leakages should be repaired!

5.4 Maintenance

On-load tap-changers in service in stable networks are normally maintained every seventh year. In these cases the filter insert should be replaced at every maintenance even if the pressure drop is lower than 4 bar, if it has not been replaced sometime during the preceding 7-year period.

For on-load tap-changers with a high switching frequency, for instance furnace transformers, the filter insert is replaced only when the pressure drop is 4.5 bar or higher, or if moisture is suspected to have come into the on-load tap-changer compartment.

5.5 Filter insert replacement

See Fig. 1.

A filter insert replacement could be performed without turning off other systems.

The filter elements need to be replaced when there is a pressure drop of 4.5 bars over the filter elements. (At normal service temperature)

NOTE: *Do not break the sealed package of the new filters insert until immediately before installation.*

1. Stop the motor of the filter unit by switching off the power
2. Close the valves in the inlet and outlet tubes.
3. Check that there is no pressure applied to the filter unit when the work is started. The pressure gauge should show 0 bar (see Fig. 5a)
4. Undo the draining plug (8 mm socket head) by turning counter clockwise (see Fig. 5b). About 3-4 liters of oil will be drained.
5. Dismantle the filter housing lids (item 25) by turning it counter clockwise (see Fig. 5c)

6. Pull the filter inserts out of the filter housings (item 20) (see Fig. 5d). Place them in a suitable vessel.
7. Attach new o-rings to the lids. Lightly oil the o-rings. New o-rings are delivered with the new filter inserts (see Fig. 5e)
8. Take the new filter elements out of their plastic bags. Throw the plastic bag, together with the silica gel in a dedicated place (see Fig. 5f)

NOTE: *Remove the package of silica gel from the new filter inserts before installation.*

9. Insert the new filter elements into the filter housings (see Fig. 5g)
10. When the oil has been drained, replace the o-ring on the draining plug. A new o-ring is delivered together with the filter inserts. Mount the draining plug back by turning clockwise (see Fig. 5b)
11. Open the inlet valve, start the pump and fill up the filter housings with oil until they are nearly full. Stop the pump.
12. Remount the filter housing lids (item 25) by turning clockwise by hand (see Fig. 5c)
13. Open the outlet valve.
14. Start the filter unit.
15. Check that no leaks have occurred.

CAUTION

A used filter insert is a hazardous waste and has to be handled according to local instructions.



Fig. 5a.

fm_00289

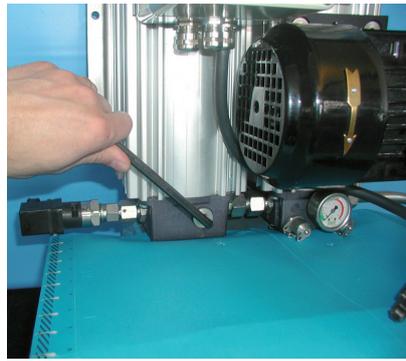


Fig. 5b.

fm_00290

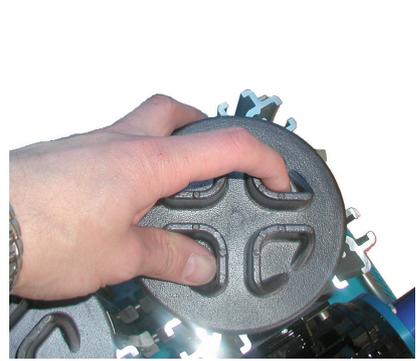


Fig. 5c.

fm_00291



Fig. 5d.

fm_00292



Fig. 5e.

fm_00293



Fig. 5f.

fm_00294

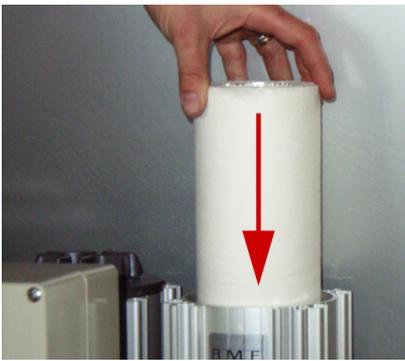


Fig. 5g.

fm_00295

6 Repair

The lifetime of the oil filter unit is long. Besides replacement of filter insert, no repair work should be needed.

However, after long time in service the motor/pump unit may be worn and needs to be replaced. The motor/pump unit may also be damaged due to over-voltages. The motor and pump is a sealed unit and must be replaced as one unit.

6.1 Replacement of motor/pump unit

See Fig. 1

For ordering, see chapter 7 Spare parts list.

6.1.1 Tools

- Normal set of handtools

6.1.2 Material

- Motor/pump unit
- Sealing rings for 17 and 23
- Bucket (oil resistant)

6.1.3 Dismounting

Switch off the oil filter unit. Close the valves in the tubes on both sides of the oil filter unit.

WARNING

Make sure that the voltage is properly switched off before starting wiring work!

Put a bucket under the inlet connection (item 23). Drain the filter housing completely.

Disconnect the tubes. Disconnect the threaded couplings from the pump.

Disconnect the electrical power supply cable from the motor/pump unit.

Unscrew the four bolts retaining the motor/pump unit and lift it off. Take care of the screws and the washers.

6.1.4 Remounting

Put the motor/pump unit in place on the mounting plate.

Mount and tighten the four bolts.

Mount the threaded couplings to the pump, using new sealing rings.

Mount the tubes.

Fill up the filter housings with oil.

Open the valves in the tubes on both sides of the oil filter unit.

WARNING

Make sure that the voltage is properly switched off before starting wiring work!

Reconnect the electrical power supply cable to the motor.

Make a quick start and stop of the motor/pump unit and check the direction of rotation. The direction is shown with an arrow on the unit.

WARNING

If the rotation direction is wrong, the filtration of the oil will be poor, and in worst case, a flashover may occur in the on-load tap-changer.

If necessary, change the rotation direction by changing place of two supply wires to the 3-phase motor.

Make a final check of the rotation direction of the motor/pump unit by slowly closing the valve on the outlet tube. The pressure gauge should show increasing pressure. If not, change the rotation direction as described earlier and check again.

Open the valve fully afterwards.

6.1.5 Filling up oil in the conservator

Switch off the oil filter unit by switching off the power.

Shut the oil valves in the inlet and outlet tubes and on the on-load tap-changer. Loosen the flange connection on the oil valve of the on-load tap-changer. Connect an oil pump to the flange, open the oil valve and pump in oil until the level of the conservator is right.

Shut the oil valve and remove the oil filling connection. Reconnect the inlet tube of the oil filter unit. Make sure that the O-ring is in place. Open the oil valves on the inlet and outlet tubes and on the on-load tap-changer and start the oil filter unit.

7 Spare parts list

7.1 Introduction

This spare parts list has been compiled to help you with procurement of spares. To obtain trouble-free deliveries you should note a few things which are explained in the following text.

The breakdown level and general contents of this list have been worked out to cover normal customer requests. Our spare part department will assist if you require any specific item that is not included in the list.

7.2 Oil filter unit serial number

The rating plate on the oil filter unit shows the serial number of the device you are ordering spares for. It is important to have this information, because the manufacture of parts gradually changes as materials and manufacturing technology improves.

ABB makes every effort to supply spares that should fit your requirements. Some parts of later manufacture than those you are replacing may need some adaption to fit into your device. Our spare part department need to know the serial number to supply exactly what you require.

7.3 Item number

Item numbers are shown in Fig. 1 and in the lists.

7.4 Name of item

The name should be specified when ordering to make sure the right type of item is ordered.

7.5 Quantity

The figures given represent the number of items that are fitted to one oil filter unit.

7.6 Remarks

Information of the content and reference to Fig. 1.

7.7 General arrangement

The general arrangement of an oil filter unit is shown in Fig. 1.

7.8 Standard spare parts

Standard spare parts for the oil filter unit are filter insert, motor and pump.

7.9 Special spare parts

If you need parts other than those in the list, our staff will be happy to assist you. Please use Fig. 1 as a reference when discussing your requirements. As usual, the serial number are essential for ordering.

7.10 Spare parts for oil filter unit

See Fig. 1.

Item No.	Name of item	Quantity	Type, remarks
1	Auxiliary switch, motor protector	1	
2	Motor protective switch	1	
3	Pressure switch	1	
4	Motor/pump unit	1	
6	Pressure gauge	1	
7	Filter element	2/4	30 SNV
8	Threaded test point	2	Minimes 1/4" BSP
9	Shunt release	1	

8 Recycling

8.1 Introduction

The following instructions should only be seen as recommendations for environmentally sound disposal of machines. It is the customer's responsibility to ensure that local regulations are followed.

8.2 Recycling of packaging material

Once the oil filter has arrived on site, the packaging material will need to be removed.

- Any wood packaging can be burned. For some countries, the packaging used for shipping by sea is made of impregnated wood that must be recycled according to local regulations
- Plastic wrappings can be recycled.

8.3 Scrapping and destruction

The end user has to, when the equipment has served its time, take care to the current practice and local regulations for scrapping and destruction.

8.4 Approximate material content

The material used in manufacturing of the oil filter unit is mainly stainless steel and aluminum. Also minor parts of, among others, copper, plastics and rubber are included.

8.5 Hazardous waste

The oil from the filter unit and used filters is a hazardous waste and has to be handled in accordance with local regulations.



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